

Notes on the Habits of *Cicindela*.

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The following notes were made during a term of enforced idleness, and although these observations on the habits of *Cicindela repanda* and *purpurea* may be common knowledge to most entomologists, I have never seen them in print and they may be new to some.

Their habits were studied both in the field with the use of an opera glass, and while they were confined in a box with glass sides. This cage was placed on a table and allowed the observation of their actions to be made with the greatest ease.

Besides the usual habitat of dirt roads, paths in grassy swards and bare places generally, *C. purpurea* was found in fields where the grass was short and sparse, with small open places the size of one's hand. In such places they do not flush easily, and instead of flying when disturbed made their escape by running in and out of the grass, hiding under a tuft of grass, more like a carabid than a cicindelid. In the early spring, on hot days, they were found in numbers in such places, very lively and active. In August and September they were found only in roadways and lanes where the grass has been worn away by travel, disporting themselves more soberly than their spring brethren. They are strong fliers, but usually content themselves with short excursions, unless persistently pursued. When pursued they fly a few feet farther down the path, then alight; this will be repeated once or twice, but if still disturbed, they turn from the path and alight in the grass alongside of it. They are strong and rapid runners, and after dropping in the grass, run with great rapidity towards an open space and either take flight immediately or lie crouched to the ground, ready to take wing if further disturbed. They are diurnal in habit, but in the early spring and summer, if the day was hot, they remained active until late in the evening and then retired for the night under a chip of wood or stone. In late summer and fall they were found on cloudy and cool days, in small burrows, dug at the foot of clayey banks or even in the sides of a wagon rut, lying in wait for any small insect that may come near, rushing out at these, and, if making a cap-

ture, retiring to the burrow to eat. These burrows were readily found, as the little pile of freshly dug pellets of earth betrayed the insects' hiding place. Their gait, when undisturbed, is rather deliberate for members of this genus, they walk slowly, exploring their feeding ground with great thoroughness, making dashes at any small insect that comes within range of their vision. One that was watched, traversed a lane twice in an hour without taking wing. The distance traveled was about one hundred and twenty feet, without counting the zig-zags from side to side, made in quartering the ground in search of food.

In captivity they were voracious eaters, feeding on flies and other soft-bodied insects that were killed and placed in their cage. Eight or ten flies were none too much for a single beetle. They were particularly fond of ants, a small black variety being their favorite. *C. purpurea* is the only *Cicindela* that was observed that would capture and eat ants, in fact they seemed to prefer them to any other food offered. They were able to see the ants at about four or five inches away; when seen the ant was rushed, bitten once and given a toss, as a terrier does when he catches a rat, rushed again and bitten, this being repeated until the ant showed little or no signs of life, when it was very deliberately chewed and swallowed. While hunting, they stand very high; when biting their prey they have a queer see-saw motion of their body, bobbing their head up and down and standing very high on their hind legs. When disturbed they squat instantly and remain motionless, if the danger becomes more threatening, they spring into the air and take wing. That they have this power of springing into the air, and to which perhaps is due their ability to take wing so readily, is seen in those who from ankyloses of the elytra are unable to fly. One of these deformed beetles that was under observation was able to jump clear from the ground a little over an inch. They may hibernate, as they were found late in October buried to the depth of eighteen inches very much alive. One that was kept in captivity, captured late in the fall, was alive in its burrow at Christmas time. It died shortly afterwards, due probably to neglect to keep the earth in its cage moist.

Cicindela repanda was found everywhere during the summer. They began to make their appearance here the last of April or the first of May, in sandcuts, roadways and railroad cuttings. They were gregarious, one portion of the sandcut swarming with them and none to be found a hundred feet away. Later in the summer they were found on the shores of the lake and river, where every sandspit was covered with them on a hot day. When flushed they flew but a short distance, then alighted; if persistent pursuit was made of an individual, it would fly some fifty or more feet before alighting, or what is more likely, would circle around the pursuer and alight at some distance behind him. The insect usually squats as closely to the ground as it can after alighting and remains motionless. If the pursuer remains absolutely stationary after the insect alights, in a short time, two or three minutes, it will raise up from its squatting position and begin to look for food, running rapidly, stopping every foot or so, zig-zagging so as to quarter the ground thoroughly. In only a small per cent. of those watched did they turn just as they alighted to face the pursuer. This manœuvre was more apt to occur if they were flying with the wind, and was probably to enable them to alight easily. *Cicindela repanda* stands very high on its feet in walking, resting upon the outer joints of the tarsi. If disturbed it squats close to the ground; if further frightened, jumps a little into the air, unfurls its wings and is away. They would usually flush when one is about four to six feet from them, especially if one is walking with the wind or his shadow is cast before him: if great care is taken in moving, walking very slowly and quietly, they did not take alarm until one approached within two feet or less. Their vision seems limited to four or six inches; a stick could be pointed towards them until it reached within seven inches, without frightening them, a further approach was apt to start them off. None were seen to take notice of insects that passed them at a further distance than four inches. In captivity they eat flies, preferably the ordinary house-fly. After seizing the fly they run a short distance with it before beginning to eat. During the time of eating they were very timid, running if another beetle comes near them. It took one four or

five minutes to devour a house-fly, and for several minutes after the fly had disappeared the beetle stood, chewing and chewing like a cow with a cud. Small beetles like a *Bembidium* for instance, when put in the cage, would be chased and bitten, but no harm done them. They seemed in mortal fear of ants, running away from them and never offering to bite or chase them. They are very thirsty beings, those kept in captivity drank after every feeding; the first thing they did in the morning after emerging from their burrows was to drink, and also at various other times during the day. Their method of drinking is to seize a morsel of moist sand with their mandibles, and with the head thrown back hold it free from the ground and suck the water from it. If the sand was quite wet they would bury their jaws into it almost as deep as their eyes, with the mandibles spread far apart, and drink in that way. A saucer was sunk in the sand in the cage to imitate a pond; at no time was one seen to drink from it. As an experiment one of the beetles was placed in a separate cage where the sand in it had been baked dry, a small glass receptacle easy to drink from and full of water was put on the bottom of the cage, great care being taken that no water was spilled on the sand. The beetle did not drink from it, and died, probably from thirst.

The males are very amorous, copulating while in captivity almost constantly. The manner of accomplishing the copulatory act is as follows: The male seizes the female with his mandibles around the lower segment of the thorax, and thrusting out his penis, which is exceedingly long for the size of the insect, of a brown color and curved upwards, tries to coax open the female's receptacle. If she is willing, this is a short process and the penis was thrust in with the utmost vigor its whole length. A few thrusts are followed by a period of rest, during which the penis is partially withdrawn. This period of rest is followed by another one of activity, to be again followed by a rest; this continues for about ten minutes, when the female makes her escape. When the female is not so complacent, she thrusts the end of her abdomen down against the ground to prevent the entrance of the male organ. Then begins a series of

manœuvres on the part of the male; he hugs her more closely, and standing high on his hind legs, with his middle legs lifts her abdomen from the ground, which she is pressing all the time, coaxing with the end of his penis, endeavoring to effect an entrance. Usually he succeeds, though sometimes the female is adroit as well as obdurate, and after some minutes spent in this amorous struggle his passion is gone, and the female releases herself from his embrace. One of the beetles was more passionate than his fellows, going without food, riding one female several hours, though unable to effect an entrance, and finally copulating with a dead female that lay in a corner of the cage.

Each afternoon, about five o'clock on ordinary days, about seven when the weather was extremely warm, they would retire to a shallow burrow dug in the sand. This burrow was dug near the edge of some object, like a stone or small block of wood. In this burrow the beetle stayed until eight or nine in the morning, and on days that were extremely warm they would emerge somewhat earlier, but, as a rule, they were late risers. These burrows were made by loosening the sand with the mandibles, then pushing it back, first with the fore legs, then with the middle legs, and then with the hind legs. The legs are used alternately, all on one side, then all on the other side. These burrows were one-half to one inch deep and opened out at the bottom into a chamber about one-half inch in diameter, enabling the beetle to turn around at the bottom of the burrow and face the entrance. Sometimes the burrow was made larger and two or more inhabited it. On rainy or cold days the beetles remained in their burrows. During one rainy spell they kept hidden for three days, then emerged as lively as ever.

There was frequently observed certain actions of the insects confined in the cage, which simulated play. These same actions were observed twice in the late summer among some beetles that crowded a little sandspit on the banks of the river. This play, if it can be called such, consisted in a cicindelid rushing at a fellow, either snapping at him with his mandibles or merely bumping against him and then running off, when the jostled one would give chase and they would run around the cage after one another. Sometimes a beetle would jostle another

several times before the jostled one would give chase. While watching them do this one was reminded of boys at play.

In captivity they lived about two months; towards the end they became cripples, legs and antennæ were lost, the struggle for existence became more arduous and they finally succumbed.

Twice I had the good fortune to see *C. repanda* ovipositing. The female, after several attempts, succeeded in forcing the end of the abdomen, or an extruded portion which acted as an ovipositor, through the hard crust of sand. The hind legs were wide apart, the middle and front legs were extended to their full extent, just touching the ground. Her position was that of sitting on the end of the abdomen. The act lasted about ten minutes, and during that time she showed no alarm at a stick pointed at and almost touching her. How many eggs were laid was not ascertained. Two eggs were obtained, one was a straw-yellow, the other a pearl-gray. The yellow one was 0.50 mm. wide, 0.78 mm. long, the gray one 0.45 mm. wide, 0.75 mm. long. Their shape was a short oval, with corrugated surface of a triangular pattern. At one pole there was a well-defined ridge, above which the egg was flattened and slightly lower than the surrounding portion of the egg. They were held together and also adhered to the sand by a few adhesive filaments.

A new *Corethrella* from Jamaica.

By M. GRABHAM.

Corethrella appendiculata n. sp.

Female.—Head black, covered sparingly with very small yellow hairs; a few long yellow hairs along the borders above the eyes. Eyes black, kidney-shaped. Proboscis and palpi yellow. Antenna: basal joint nearly globular, a few fine golden hairs on its upper surface and around the point of articulation of the second joint there is a sculptured radiating pattern; second joint densely covered with hairs; each of the following joints except the apical one has a band of long hairs above the middle, as well as the longer basal verticel; apical joint narrow, longer than the penultimate. Mesothorax black, with many fine yellow hairs on its surface as well as a few long black ones. Scutellum narrow, with a few long yellow hairs on its border. Metathorax black, nude. Abdomen densely covered with long golden-yellow hairs. Venter black.

Wings pale yellow, densely scaled with hair-like scales on the veins; outer and inner margins with a heavy fringe of coarse, long scales. A